Lasers in Surgery and Medicine 25:126–130 (1999)

Total Intravenous Anesthesia for Office-Based Laser Facial Resurfacing

Rodney L. Trytko, MD, MBA[1]* and W. Philip Werschler, Jr., MD[2]*

[1]Anesthesia Associates, Spokane, Washington 99204
[2]Spokane Dermatology Clinic, Spokane, Washington 99204

Background and Objective: **Providing general anesthesia in an office-based setting can be time consuming, risky, and expensive. The purpose of this study was to describe a technique for total intravenous anesthesia (TIVA) technique that can be easily utilized by anesthesiologists in an office-based setting for laser facial resurfacing.**
Study Design/Materials and Methods: **Twenty-five American Society of Anesthesiologists (ASA) status classification I–II patients (22 females and three males) elected general anesthesia for laser facial resurfacing. All patients were premedicated with glycopyrrolate (0.2 mg IV). All anesthetics were administered by board-certified anesthesiologists, and ASA Standards for Anesthesia Monitoring were strictly followed. An induction dose of propofol (2.0–2.5 mg/kg IV) was followed by laryngeal mask airway insertion (size 3 or 4). TIVA was maintained with a propofol infusion (50–250 mcg/kg/minute IV). Supplemental midazolam (2–4 mg IV), fentanyl (0.05–0.20 mg IV), and oxygen (2–4 l/minute) were administered as needed. After completion of the laser procedure, TIVA was discontinued and the patients were allowed to awaken. Patients were discharged after achieving a Modified Post-Anesthetic Discharge Score of ≥ 9.**
Results: **Mean procedure duration was 48 ± 21 minutes, and time to discharge after the procedure was 16 ±6 minutes. All procedures and anesthetics were well tolerated and without complications. The only post-procedure complaint was an isolated, minor, and temporary sore throat.**
Conclusions: **TIVA is an excellent method for providing anesthesia for laser facial resurfacing in an office-based setting. Lasers Surg. Med. 25:126–130, 1999.** **© 1999 Wiley-Liss, Inc.**

Key words: anesthesia; total intravenous anesthesia; laser; facial; laryngeal mask airway

INTRODUCTION

Laser facial resurfacing is among the many new minimally invasive surgical procedures that are being performed in an office-based setting. The CO_2 laser used for facial resurfacing procedures requires intense analgesia, minimal distortion of the facial tissues, and avoidance of supplemental oxygen. The discomfort of intense local heat generated by the CO_2 laser is very difficult to block either locally or regionally. Also, a motionless operative field facilitates the operating practitioner, thus improving the quality and reducing the duration of the procedure. For all of these reasons, a general anesthetic is preferred for laser facial resurfacing.

Providing general anesthesia in an office-based setting can be time consuming, risky, and expensive. General anesthesia should only be delivered or directed by an anesthesiologist; in a few states this is a statutory requirement. Many an-

*Correspondence to: Rodney L. Trytko, Anesthesia Associates, 801 W. 5th Avenue, STE 405, Spokane, Washington 99204, or to: W. Philip Werschler, Jr., Spokane Dermatology Clinic, Spokane, Washington 99204.

Accepted 16 March 1999

esthesiologists are inexperienced and uncomfortable with the office setting. Many offices lack noninvasive monitoring equipment, airway management equipment and medications, emergency resuscitation equipment and medications, recovery facilities, and appropriate perioperative nursing personnel. Many offices also lack adequate suction for anesthetic trace gas scavenging; and, therefore, the utilization (and expense) of an anesthesia machine is contraindicated. Total intravenous anesthesia (TIVA) techniques with minimal complications and extremely rapid recoveries have been described [1–8] and are well suited for laser facial resurfacing.

We describe a TIVA technique for providing anesthesia by anesthesiologists for laser facial resurfacing in an office-based setting.

MATERIALS AND METHODS

Twenty-five patients elected general anesthesia for laser facial resurfacing. A protocol for total intravenous anesthesia was utilized (Appendix A). All anesthetics were administered by board-certified anesthesiologists, and ASA Standards for Anesthesia Monitoring (Appendix B) were strictly followed. All patients were premedicated with glycopyrrolate (0.2 mg IV). An induction dose of propofol (2.0–2.5 mg/kg IV) was followed by laryngeal mask airway insertion (size 3 or 4). TIVA was maintained with propofol (50–250 mcg/kg/min IV), supplemental midazolam (2–4 mg IV), and fentanyl (0.05–0.20 mg IV). Spontaneous respiration with a Jackson-Rees breathing circuit was maintained throughout the procedure and oxygen (2–4 l/minute) was administered as needed. Laser facial resurfacing was accomplished using a 40-watt continuous mode CO_2 laser with an optically flash-scanned beam profile (Silktouch, ESC/Sharplan, Yokneam, Israel). Operating parameters utilized include 4–9 mm spot size, 6–20 watts, and 125 mm and 200 mm handpieces. After completion of the laser procedure, TIVA was discontinued, occlusive dressings were placed over all lased surfaces (Flexan), and the patients were allowed to awaken. Patients were discharged after achieving a Modified Post-Anesthetic Discharge Score (Appendix C) of ±9.

Patient demographics, procedure duration, dosages of the various medications, discharge times, complications, and patient complaints were recorded. A simple descriptive statistical analysis of these variables was performed. The effects of midazolam on propofol requirements were analyzed utilizing a paired t-test.

RESULTS

All patients were successfully anesthetized utilizing this technique. The sample consisted of 22 females and three males; and among these, 15 were ASA I and 10 were ASA II. The mean age of our patients was 47 ± 10 years. The mean dosages of the medications utilized were propofol 530 ± 208 mg, midazolam 1.1 ± 1.4 mg, and fentanyl 0.13 ± 0.06 mg. The propofol requirements were significantly decreased with the addition of midazolam ($p = 0.019$). The mean procedure duration was 48 ± 21 minutes and the mean discharge time was 16 ± 6 minutes. Most of the patients [18] were administered supplemental oxygen. No complications, including nausea and vomiting, were observed. The only patient complaint was an isolated minor and temporary sore throat.

DISCUSSION

We originally utilized various combinations of local and regional anesthetic techniques along with conscious sedation for laser facial resurfacing; however, these techniques proved inadequate for a number of reasons. Infiltration of local anesthetics distorts the facial anatomy and seems to increase postoperative discomfort. Many patients complained about discomfort during the laser procedures, particularly the local intense heat from the laser. Movement of the surgical field increases the risk of inadequate surgical results and complications. Also, the time requirement for a typical procedure was excessive, between one and three hours.

Since general anesthesia appears to be indicated for laser facial resurfacing, we developed a cost-effective method that could be utilized by anesthesiologists in an office-based setting where trace gas scavenging equipment is rarely available. Without such scavenging capabilities, utilizing potent anesthetic agents is contraindicated. By eliminating the need for an anesthesia machine, the costs associated with providing an anesthetic are dramatically reduced. By adhering to ASA basic monitoring standards (Appendix B) and accepted discharge criteria (Appendix C), the possibility of anesthetic complications is minimized. Despite the minimal risk of airway or cardiovascular complications, we believe that airway management equipment, emergency airway and

cardiac medications, and a defibrillator should be immediately available.

We utilized a propofol-based TIVA technique supplemented with fentanyl and midazolam. TIVA is a well described and accepted method of anesthesia for a variety of surgical procedures [1–8]. With TIVA, the patients are asleep, the surgical field is steady, the time requirements for the operating practitioner are substantially decreased, and the postoperative complications are minimized. The absence of a local or regional block did not appear to increase the incidence of postoperative facial discomfort. In fact, the absence of a facial block actually seemed to decrease postoperative discomfort. Finally, after our TIVA protocol, the patients were ready to be safely discharged usually in less than 20 minutes after surgery.

A properly conducted propofol TIVA technique will usually result in a spontaneously breathing patient [1]. Apnea, if it occurs, is immediate, short-lived (less than 10 minutes), and easily managed with controlled ventilation [1,9]. A Jackson-Rees breathing circuit is ideal for these anesthetics because of its minimal breathing resistance and capability of providing controlled ventilation as necessary. Also, the excess supplemental oxygen is exhausted away from the operative field.

A recent report by Blakeley [8] utilizing TIVA with propofol for laser facial resurfacing yielded results similar to our study. Their protocol included multiple premedication agents, regional nerve blocks (supraorbital, supratrochlear, and mental), and ketamine supplementation. Strict control of cardiostimulatory activity was assured with intermittent intravenous labetalol and propranolol. Relatively more intraoperative and postoperative events were noted, including postoperative nausea and vomiting.

Postoperative nausea and vomiting is a common problem that is uncomfortable for the patients and delays discharge. Fortunately, none of our patients demonstrated postoperative nausea or vomiting. Propofol infusions reduce postoperative nausea and vomiting in some studies [10,11] and are ineffective in others [12,13]. A recent meta-analysis by Sneyd [11] demonstrated that patients who received maintenance of anesthesia with propofol had a significantly lower incidence of postoperative nausea and vomiting in comparison with inhalational agents. This lower incidence occurred regardless of induction agent, choice of inhalation agent, presence or absence of nitrous oxide, age of patient, or use of opiate.

In this study, patients only had one complaint, a temporary and minor sore throat. Sore throats are well described with laryngeal mask airways [14] and are usually the result of either traumatic insertions or excessive cuff pressures.

In conclusion, total intravenous anesthesia with a laryngeal mask airway is an excellent method for providing anesthesia for laser facial resurfacing to healthy adults in an office-based setting.

REFERENCES

1. Ashworth J, Smith I. Comparison of desflurane with isoflurane or propofol in spontaneously breathing ambulatory patients. Anesth Analg 1998;87(2):312–318.
2. Chan VW, Chung FF. Propofol infusion for induction and maintenance of anesthesia in elderly patients: recovery and hemodynamic profiles. J Clinical Anesth 1996;8(4): 317–323.
3. Jellish WS, Leonetti JP, Murdoch JR, Fowles S. Propofol-based anesthesia as compared with standard anesthetic techniques for middle ear surgery. Otolaryngol Head Neck Surg 1995;112(2):262–267.
4. Dyer RA, Llewellyn RL, James MF. Total I.V. anaesthesia with propofol and the laryngeal mask for orthopaedic surgery. Br J Anaesth 1995;74(2):123–128.
5. Candelaria LM, Smith RK. Propofol infusion technique for outpatient general anesthesia. J Oral Maxillofac Surg 1995;53(2):124–128.
6. Collins SJ, Robinson AL, Holland HF. A comparison between total intravenous anesthesia using a propofol/alfentanil mixture and an inhalational technique for laparoscopic gynaecological sterilization. Eur J Anaesthesiol 1996;13(1):33–37.
7. Roekaerts PM, Gerrits HJ, Timmerman BE, de Lange S. Continuous infusions of alfentanil and propofol for coronary artery surgery. J Cardiothorac Vasc Anesth 1995;9(4):362–367.
8. Blakely K, Klein K, White, P, Trott S, Rohrich R. A total intraveneous anesthetic technique for outpatient facial laser resurfacing. Anesth Analg 1998;87(4):827–829.
9. Bailey PL, Pace NL, Ashburn MA, Moll JW, East KA, Stanley TH Frequent hypoxemia and apnea after sedation with midazolam and fentanyl. Anesthesiology 1990;73(5):826–830.
10. Gan TJ, Ginsberg B, Grant AP, Glass PS. Double-blind, randomized comparison of ondansetron and intraoperative propofol to prevent postoperative nausea and vomiting. Anesthesiology 1996;85(5):1036–1042.
11. Sneyd JR, Carr A, Byrom WD, Bilski AJ. A meta-analysis of nausea and vomiting following maintenance of anaesthesia with propofol or inhalational agents. Eur J Anaesthesiol 1998;15(4):433–445.
12. Scuderi PE, D'Angelo R, Harris L, Mims GR 3rd, Weeks DB, James RL. Small-dose propofol by continuous infusion does not prevent postoperative vomiting in females undergoing outpatient laparoscopy. Anesth Analg 1997;84(1):71–75.

13. Harper I, Della-Marta E, Owen H, Plummer J, Ilsley A. Lack of efficacy of propofol in the treatment of early postoperative nausea and vomiting. Anaesth Intensive Care 1998;26(4):366–370.
14. Burgard G, Mollhoff T, Prien T. The effect of laryngeal mask cuff pressure on the postoperative sore throat incidence. J Clin Anesth 1996;8(3):198–201.
15. Approved by the American Society of Anesthesiologists' House of Delegates on October 21, 1986 and last amended on October 23, 1996.
16. Chung F. Discharge criteria—a new trend. Can J Anesth 1995;42(11):1056–1058.

APPENDIX A: LASER FACIAL RESURFACING ANESTHESIA PROTOCOL

1. American Society of Anesthesiologists (ASA) Class I–II adults without gastroesophageal reflux symptoms. ASA Basic Monitoring Standards followed.
2. Equipment check.
   a. Oxygen tank full.
   b. Laryngoscope, endotracheal tube, LMA, and face mask.
   c. Positive pressure breathing device immediately available.
   d. Monitors functioning properly.
   e. Suction immediately available.
3. Premedication options.
   a. Gycopyrrolate 0.2 mg IV
   b. Ondansetron 4 mg IV prn
4. Induction.
   a. Preoxygenation
   b. Midazolam 2.5–5.0 mg IV prn
   c. Fentanyl 25–50 mcg IV prn
   d. Propofol 2–2.5 mg/kg IV
5. LMA insertion.
6. Maintenance.
   a. Propofol 50–250 mcg/kg/minute IV
   b. Fentanyl 25 mcg IV prn
7. Remove LMA when awake.
8. Other Options.
   a. Consider face block with IV sedation.
   b. Use oral airway in place of LMA.
9. Discharge with a Modified Post-Anesthesia Discharge Score ≥ 9.

APPENDIX B: AMERICAN SOCIETY OF ANESTHESIOLOGISTS MONITORING STANDARDS [15]

Standard I.

Qualified anesthesia personnel shall be present in the room throughout the conduct of all general anesthetics, regional anesthetics, and monitored anesthesia care.

Standard II.

During all anesthetics, the patient's oxygenation, ventilation, circulation, and temperature shall be continually evaluated.

Oxygenation.

1. Inspired gas: During every administration of general anesthesia using an anesthesia machine, the concentration of oxygen in the patient breathing system shall be measured by an oxygen analyzer with a low oxygen concentration limit alarm in use.
2. Blood oxygenation: During all anesthetics, a quantitative method of assessing oxygenation such as pulse oximetry shall be employed.

Ventilation.

1. Every patient receiving general anesthesia shall have the adequacy of ventilation continually evaluated.
2. When an endotracheal tube or laryngeal mask is inserted, its correct positioning must be verified by clinical assessment and by identification of carbon dioxide in the expired gas.

Circulation.

1. The electrocardiogram shall be continuous. Every patient receiving anesthesia shall have arterial blood pressure and heart rate determined and evaluated at least every 5 minutes.
2. Every patient receiving general anesthesia shall have, in addition to the above, circulatory function continually evaluated by at least one of the following: palpation of a pulse, auscultation of heart sounds, monitoring of a tracing of intraarterial pressure, ultrasound peripheral pulse monitoring, or pulse plethysmography or oximetry.

Body Temperature.

Every patient receiving anesthesia shall have temperature monitored when clinically significant changes in body temperature are intended, anticipated, or suspected.

APPENDIX C: MODIFIED POST-ANESTHETIC DISCHARGE SCORING SYSTEM [16]

1. Vital Signs.
   2 = Within 20% of preoperative levels.

1 = 20 – 40% of preoperative value.
0 ≥ 40% of preoperative level.

2. Ambulation.
   2 = Steady gait/no dizziness.
   1 = With assistance.
   0 = None/dizziness.
3. Nausea/vomiting.
   2 = Minimal.
   1 = Moderate.
   0 = Severe.
4. Pain.
   2 = Minimal.
   1 = Moderate.
   0 = Severe.
5. Surgical Bleeding.
   2 = Minimal.
   1 = Moderate.
   0 = Severe.

The total score is 10. Patients scoring ≥ 9 considered fit for discharge.